

AC 27/2/13
Item no. 4.41

UNIVERSITY OF MUMBAI



Syllabus for Sem III and Sem IV

Program: M.Sc.

**Course: Zoology-Biotechnology-
Endocrinology**

(Credit based semester and Grading System with
effect from the academic year 2013–2014)

UNIVERSITY OF MUMBAI
M.Sc. in Zoology: SEMESTER III and IV

Credit Based Semester and Grading System
to be implemented from the Academic Year 2013-2014.

PREAMBLE

BOS in Zoology during its meeting constituted a pyramid committee, to revise the syllabi in Zoology, with Dr. M. K. Pejaver as the Chairperson and Senior Teachers from affiliated Colleges as Jt. Chairperson, one each for UG and PG programmes. The class-wise syllabus committees were constituted in accordance with inclusive policy of the BOS with an aim to provide faculty at large hands on training and exposure to work on syllabus committees which will go a long way in taking our subject ahead in future when these experienced staff members would shape the subject after a decade. With the introduction of Credit Based Semester and Grading System and continuous evaluation consisting of components of internal assessment and external assessment by the esteemed University, the syllabus in Zoology was revised for M.Sc. Sem I and II to be implemented with effect from 2012-2013, after approval by concerned authorities of the University.

Vide University Circular No. APD/Misc.-01/407/of 2011 dated 12/12/2011, contents of letter from K. P. Singh, Joint Secretary, UGC No. D.O.F1-1/2009-(CPP-II) dated 29/11/2011 were notified to the faculty in Zoology. As per the letter an expert committee was constituted by the UGC to look into the issue of discontinuation of dissection of live animals in the laboratory experiments in Zoology/ Life Sciences at UG and PG levels. The guidelines prepared by the expert committee and approved by UGC were notified with a viewpoint to ensure compliance of the guidelines.

A special meeting of Heads of Zoology Departments of all the Colleges affiliated to the University was convened on 17th August 2012 for deliberation on recommendation of expert committee appointed by the UGC regarding the discontinuation of dissection of live animals in laboratory experiments in Zoology / Life Sciences at UG and PG level.

In accordance with the deliberations in the above meeting, draft syllabus for M.Sc. SEMESTER-III and IV in Zoology, suitably revised, to be implemented in the Credit Based Semester and Grading System was prepared by the committee under the guidance of pyramid committee. The draft was circulated among

the heads and senior teachers of the Department of Zoology of various colleges for approval and suggestions.

In meeting of the BOS held on 12th December, the draft was approved and it was resolved to implement the revised syllabus of Zoology at M.Sc. SEMESTER-III and IV and make it effective from the Academic Year 2013-2014 after approval from concerned authorities of the University.

Chairman

Board of Studies in Zoology

University of Mumbai.

M.Sc.
Zoology - Biotechnology and Endocrinology
 Credit Based and Grading System.
 To Be Implemented from the Academic Year 2013-2014.

Semester -III

Theory

Course	Unit	TOPIC	Credits	L / Week
PSZOBT301	I	The implications of recombinant DNA technology of commercial products and microbial synthesis	4	1
	II	Large scale culture & production from recombinant microorganisms & genetically engineered animal cells		1
	III	Medical Biotechnology		1
	IV	Environmental Biotechnology I		1
PSZOBT302	I	Genome management and analysis	4	1
	II	Manipulation of gene expression in prokaryotes		1
	III	Bioinformatics		1
	IV	Animal biotechnology and Human therapies		1
PSZOEND303	I	General Endocrinology –I	4	1
	II	Gonadal differentiation		1
	III	Female reproductive tract-I		1
	IV	Conception		1
PSZOEND304	I	Hormones: Function and Classification	4	1
	II	Biochemical Aspects		1
	III	Mechanism of action of peptide hormones –II		1
	IV	Applied Endocrinology –I		1
Total			16	16

Practicals

PSZOBT3P1		Practicals based on PSZOBT301	2	4
PSZOBT3P2		Practicals based on PSZOBT302	2	4
PSZOEND3P3		Practicals based on PSZOEND303	2	4
PSZOEND3P4		Practicals based on PSZOEND304	2	4
Total			8	16
Grand Total			24	32

SEMESTER IV

Theory				
Course	Unit	TOPIC	Credits	L / Week
PSZOBT401	I	Microbial synthesis of commercial products	4	1
	II	Large scale culture & production for industrial biotechnology		1
	III	Agricultural Biotechnology		1
	IV	Environmental Biotechnology II		1
PSZOBT402	I	Genome management	4	1
	II	Manipulation of gene expression in eukaryotes		1
	III	The human genome project		1
	IV	Regulations and patents in biotechnology		1
PSZO END403	V	General Endocrinology –II	4	1
	VI	Male Reproductive System		1
	VII	Female reproductive tract-II		1
	VIII	Contraception		1
PSZO END404	V	Phylogeny and Ontogeny of endocrine glands	4	1
	VI	Biochemical Aspects		1
	VII	Mechanism of action of peptide hormones – II		1
	VIII	Applied Endocrinology –II		1
			16	16
PSZOBT4P1		Practicals based on PSZOBT4P1	2	4
PSZOBT4P2		Practicals based on PSZOBT4P2	2	4
PSZO END4P3		Practicals based on USZOEND403	2	4
PSZO END4P4		Practicals based on USZOEND404	2	4
Total			8	16
Garand Total				

M. Sc.
SEMESTER III
ZOOLOGY – BIOTECHNOLOGY ENDOCRINOLOGY
THEORY

PSZOBT301: Basics of Industrial & Environmental Biotechnology I

Unit I: The implications of recombinant DNA technology of commercial products and microbial synthesis **15**

- 1.1. The implications of recombinant DNA technology
 - 1.1.1 *General account on applications of biotechnology
 - 1.1.2 *Commercialization of biotechnology & biotech companies
 - 1.1.3 Prospects of novel food technology
 - 1.1.4 Economics of microbial biotechnology
 - 1.1.5 Areas of significant public concern: Antibiotic resistance marker gene, transfer of allergies, pollen transfer from GM plants, social, moral & ethical issues associated with GMOs.
- 1.2 Amino acids & their commercial use – production strain, process of L-glutamate, L-aspartate, L-phenylalanine, L-tryptophan.

Unit II: Large scale culture & production from recombinant microorganisms 15 & genetically engineered animal cells

- 2.1. Large scale culture & production from recombinant microorganisms:
 - 2.1.1 Batch fermentation
 - 2.1.2 Fed batch fermentation
 - 2.1.3 Continuous fermentation
 - 2.1.4 *Maximizing the efficiency of fermentation process
 - 2.1.5 Harvesting, disrupting & downstream processing
- 2.2. Large scale culture & production from genetically engineered animal cell cultures:
 - 2.2.1 Design of bioreactors for large scale animal cell culture-Batch, Fed batch
 - 2.2.2 Mammalian cell lines & their characteristics
 - 2.2.3 Media for the cultivation of mammalian cells
 - 2.2.4 *Commercial products produced with mammalian cell culture

Unit III: Medical Biotechnology **15**

- 3.1. Sub-unit vaccines

- 3.1.1 *Sub-unit Vaccine production against viruses-Herpes simplex, Bovine foot & mouth disease virus
- 3.1.2 Peptide vaccines-synthetic drugs (engineered proteins)
- 3.1.3 Genetic immunization-DNA vaccines, Antisense DNA, Therapeutic ribozymes
- 3.1.4 *Live recombinant vaccines
- 3.1.5 *Attenuated vaccines against Cholera, Salmonella sp.
- 3.1.6 Vector vaccines-Vaccine directed against viruses- Rabies virus G-protein, Hepatitis B surface antigen
- 3.1.7 Anti-idiotypic vaccine for cancer treatment
- 3.2. Monoclonal antibodies (mAbs) & therapeutic applications:
 - 3.2.1 mAbs for prevention of rejection of transplanted organs
 - 3.2.2 Treatment of bacterial blood infection
 - 3.2.3 Human monoclonal antibodies
 - 3.2.4 Hybrid human-mouse monoclonal antibodies
 - 3.2.5 HIV therapeutic agents
 - 3.2.6 Anti-tumour antibodies

Unit IV: Environmental Biotechnology I

15

- 4.1. Biomass utilization
 - 4.1.1 Microorganisms in lignocellulose degradation
 - 4.1.2 Isolation of prokaryotic & eukaryotic cellulase gene
 - 4.1.3 Manipulation of cellulase gene
 - 4.1.4 Production of single cell proteins by using biomass as raw material
 - 4.1.5 Commercial production of fructose and alcohol from biomass
 - 4.1.6 Improvements of fructose and alcohol production
 - 4.1.7 Fuel ethanol from biomass
- 4.2. Bioremediation of xenobiotic compounds
 - 4.2.1 Characteristics of xenobiotics in the environment
 - 4.2.2 Characteristics of aerobic microorganisms for degradation of organic pollutants
 - 4.2.3 Genetic engineering of biodegradative pathways- Manipulation by transfer of plasmid, manipulation by gene alteration
 - 4.2.4*Degradation of xenobiotic compounds-petroleum products, n-alkanes, alkenes, cycloaliphatic compounds, aromatic hydrocarbons, polyaromatic hydrocarbons, chlorinated organic compounds (aliphatic & aromatic)

***marked topics are to be taken for seminar**

PSZOBT302

PSZOBT302: GENETIC ENGINEERING TECHNIQUES AND ITS APPLICATIONS

Unit I: Genome management and analysis

15

1.1 The Basic tools of genetic engineering

- 1.1.1 Chemical Synthesis of DNA-Oligonucleotide synthesis by Phosphoramidite method, Synthesis of genes
- 1.1.2 *DNA Sequencing -- Maxam-Gilbert method, Sanger's dideoxynucleotide method, By using bacteriophage M13 By Primer walking
- 1.1.3 Polymerase chain reaction and its advantages

1.2 Cloning Vectors

- 1.2.1 *General purpose plasmid vectors (pUC19, pBR322)(Bacterial Vectors)
- 1.2.2 Bacteriophage and cosmid vectors
- 1.2.3 Yeast artificial chromosomes (YACs)

1.3 Analysis of genome/proteome

- 1.3.1 DNA fingerprinting/physical mapping/pulsed field gel electrophoresis
- 1.3.2 Analysis of the proteome
- 1.3.3 Analysis of mRNA transcripts

Unit II: Manipulation of gene expression in prokaryotes

15

2.1 Promoters of gene expression in prokaryotes

- 2.1.1 Prokaryotic gene expression
- 2.1.2 Isolation of functional promoters
- 2.1.3 Promoter selection with E.coli plasmid pBR316
- 2.1.4 *Promoter selection with plasmid pKO1
- 2.1.5 Gene expression from strong and regulatable promoters

2.2 Expression of cloned genes in prokaryotes

- 2.2.1 Increasing protein production and secretion
- 2.2.2 *Inclusion bodies and fusion proteins
- 2.2.3 Unidirectional tandem gene arrays
- 2.2.4 Translation expression vectors
- 2.2.5 Increasing protein stability

Unit III: Bioinformatics

15

- 3.1 Uses and application of computers in biological sciences
- 3.2 *DNA profiling: cDNA and EST's (expressed sequence tags)
- 3.3 Basic research with DNA microarrays and its application in healthcare.
- 3.4 Biomedical genome research and pharmaco genomics
- 3.5 *Random amplified polymorphic DNA (RAPD)
- 3.6 Human genomic variation-SNP's (single nucleotide polymorphisms,SNP's and disease; QTL (quantitative trait loci) and its relation to SNP's
- 3.7 Satellite DNA and its types

Unit IV: Animal biotechnology and Human therapies

15

4.1 Animal Biotechnology

- 4.1.1 *Transgenic animals and their applications:
Mice as model system for human diseases and as test case model,Cows, pigs, sheep, goats as biopharmaceuticals
Transgenic insects and birds
- 4.1.2 Recombinant DNA technology to prevent animal diseases
- 4.1.3 Conservation biology-Embryo transfer
- 4.1.4 Regulation of transgenic animals and patenting genetically engineered animals

4.2 Human therapies

- 4.2.1 Tissue engineering: Skin, liver, pancreas
- 4.2.2 *Xenotransplantation
- 4.2.3 Antibody engineering
- 4.2.4 Cell adhesion based therapies: Integrins, Inflammation, Cancer and metastasis
- 4.2.5 Targeted gene replacement for correcting a mutated gene
- 4.2.6 Site directed mutagenesis

***marked topics are to be taken for seminar**

PSZOEND303

PSZOEND303: Vertebrate Endocrinology and Reproductive Biology

UNIT – I: General Endocrinology –I

15L

1. Endocrine glands and hormones
 - Classification of hormone
 - Brief account of structural features of endocrine glands.
 - Hormonal effects and regulation –basic concepts and methods
2. Biosynthesis and secretion of pancreas, adrenal, ovary , testis and thyroid hormones.
 - Factors influencing secretion.
 - Endocrine disorders- brief description.

UNIT – II: Gonadal differentiation

15L

1. **Sexual differentiation: Genetic sex- gonadal sex- somatic sex.**
 - Differentiation of testis and Ovary: Morphological, biochemical and hormonal aspects.
 - Development abnormalities of male and female sex organs: genetic and endocrine aspects.
 - Hypothalamo- hypophyseal- gonadal axis

UNIT – III: Female reproductive tract-I

15L

1. **Study of ovary**
 - Ovary: Structure, folliculogenesis, Ovulation.
 - Sources of ovarian hormones, Ovarian androgen, inhibin, Endocrine regulation of ovarine

functions

UNIT – IV: Conception

15L

- Fertilization
- Conception
- Parturition.
- Maternal- foetal placental hormones

PSZOEND304

PSZOEND304: Comparative and Molecular Endocrinology

UNIT – I: Hormones: Function and Classification. 15L

- Hormones as messengers.
- Hormones and eukaryotic metabolic regulation
- Classification and Discovery of hormones

UNIT – II: Biochemical Aspects of Metabolism 15L

- Peptide hormones
- Thyroid hormones.
- Steroid hormones

UNIT – III: Mechanism of action of peptide hormones -I 15L

- Cell surface receptors.
- Cascade of reaction linked to signal transduction.
- Prostaglandins.
- Calcium-magnesium-protein Kinase.

UNIT – IV: Applied Endocrinology –I 15L

- Hormones, growth and development
- Hormones and human health.
- Production of hormones as Pharmaceuticals

PRACTICAL

Semester III

Practicals

Course Code PSZOBT3P1 & PSZOBT3P2

(Based on PSZOBT301 and PSZOBT302)

- 1) Demonstration of aseptic technique: Work place for aseptic handling, packing glassware (flasks, test tubes, pipettes, petridish) for sterilization, aseptic transfer of liquids (pipetting from flask to test tube)
- 2) Preparation of LB agar plate, slant, butt & demonstration of streaking technique using bacterial culture to obtain isolated colonies.
- 3) Determination of viable cell count in the given culture of bacteria by dilution & spreading technique.
- 4) Using mini-prep method isolate plasmid DNA from the given strain of bacteria & show the purity of the isolate by performing agarose gel electrophoresis.
- 5) To estimate the number of bacteria in the given culture by nephelometry.

COURSE CODE: - PSZOEND3P3

Based on PSZOEND303

1. Dissection and localization of endocrine glands in rat.
2. Permanent slide preparations of above endocrine glands (one slide each to be submitted at the time of practical examination for Islets of Langerhans, CHP method and for pituitary, Mallory triple & AB-AS-OG methods to be used).
3. Demonstration of following technique:
 - Hypophysectomy in fish (Tiliapia, catfish).
 - Thyroidectomy in a suitable animal (rat/mice).
 - Adrenalectomy in a suitable animal (rat/mice).

COURSE CODE- PSZOEND3P4

Based on PSZOEND304

Estimation of Adrenal ascorbic acid and cholesterol in

- A normal animal (mice/rat).

- After the administration of ACTH, Epinephrine.
- 1. Effect of insulin administration on the blood sugar level in mice/rat.
- 2. Paper chromatographic separation of corticoids .

Note: Minimum number of animals to be used for experiment

M.Sc.

Semester -IV

Zoology Biotechnology and Endocrinology

Credit Based and Grading System.

To Be Implemented from the Academic Year 2013-2014.

PSZOBT401: Basics of Industrial & Environmental Biotechnology II

Unit I: Microbial synthesis of commercial products

15

1.1. Microbial synthesis of commercial products

1.1.1 Organic acids & their commercial applications – Citric acid, gluconic acid, lactic acid.

1.1.2 Antibiotics – Cloning antibiotic biosynthetic gene by complementation & other methods. Synthesis of novel antibiotics & improving antibiotic production.

*Aminoglycosides & their uses

1.1.3 Polysaccharides:

Bacterial polysaccharides: General properties & their commercial applications-Dextran, Xanthan, Alginate.

Genetic engineering for the large scale production of Xanthan gum & its modification.

*Marine polysaccharides: General properties & their commercial application- Agar & agarose, Chitosan

- 1.1.4 Polyesters: Polyhydroxyalkanoates (PHA)-Biosynthesis of PHA, Biopol-commercial biodegradable plastic

Unit II: Large scale culture & production for industrial biotechnology **15**

2.1. Biotransformations

- 2.1.1 Selection of biocatalyst-screening & use of novel existing biocatalyst
- 2.1.2 Genetic modification of existing biocatalyst (Indigo biosynthesis)
- 2.1.3 Biocatalyst immobilization-
Methods of immobilization- Cross linking, supported immobilization, adsorption & ionic binding, covalent coupling, lattice entrapment
- 2.1.4 Immobilized soluble enzymes & suspended cells
- 2.1.5 Immobilization of multi-enzyme systems & cells
- 2.1.6 *Immobilized enzyme reactors- Batch reactors, continuous reactors
- 2.1.7 Analytical enzymes-
Enzymes in diagnostic assays: Test strip systems & Biosensors-
Electrochemical & optical type

Unit III: Agricultural Biotechnology **15**

3.1. Agricultural Biotechnology:

- 3.1.1 *Nitrogen fixation
- 3.1.2 Nitrogenase-Component of nitrogenase; Genetic engineering of nitrogenase cluster
- 3.1.3 Hydrogenase-Hydrogen metabolism
- 3.1.4 Genetic engineering of hydrogenase gene
- 3.1.5 Nodulation-Competition among nodulation organisms, genetic engineering of nodulation gene
- 3.1.6 Microbial insecticides-Toxins of *Bacillus thuringiensis*, mode of action & use of thuringiensis toxins, thuringiensis toxin gene isolation, genetic engineering of *Bacillus thuringiensis* strains & cloning of thuringiotoxin gene.
- 3.1.7 *Developing insect resistant, virus resistant & herbicide resistant plant
- 3.1.8 Algal products: Fuels from algae, marine natural products & their medical potential-anticancer, antiviral compounds, antibacterial agents.

Unit IV: Environmental Biotechnology II **15**

4.1. Bioabsorption of metals (Recovery from effluents)

- 4.1.1 *Bioabsorption by fungi, algae, moss & bacteria
- 4.1.2 Mechanism of bacterial metal resistance & genetic engineering for specific proteins

- 4.1.3 Bioreactors for bioabsorption-packed bed, fluidized bed, rotating disc, single blanket, sequential reactors
- 4.1.4 Phytoremediation & its use in biotechnology
- 4.2. Bioleaching of metals
 - 4.2.1 Biochemical mechanism of bioleaching
 - 4.2.2 Extraction from mixtures
 - 4.2.3 Types of bioleaching
 - 4.2.4 Methods for bioleaching-Tank & heap bioleaching
 - 4.2.5*Microorganisms used for bioleaching

***marked topics are to be taken for seminar**

PSZOB402: Genome management, manipulation, regulations and patents in biotechnology

Unit I: Genome management

15

1.1 The Basic tools of genetic engineering

- 1.1.1 Gene transfer techniques: Protoplast fusion, calcium phosphate, precipitation, electroporation, liposome, ligand mediated, gene gun or biolistic approach, viral mediated
- 1.1.2 Selection and screening of recombinants
- 1.1.3 *Nucleic acid probes and hybridization, Southern blotting and Northern blotting
- 1.1.4 Immunological assays for identification of gene product, Western blot

1.2 Cloning Vectors

- 1.2.1 *Retrovirus and SV40 vectors
- 1.2.2 Special purpose vectors- Expression vectors, Secretion vectors, Shuttle or bi-functional vectors, single stranded phage and phagemids

Unit II: Manipulation of gene expression in eukaryotes

15

- 2.1 Eukaryotic gene expression
- 2.2 *Introduction of DNA into fungi-yeast and filamentous fungi (fungal transformation)
- 2.3 Heterologous proteins production in yeasts
- 2.4 Heterologous proteins production in filamentous fungi

- 2.5 Cultured insect cells expression systems-
Baculovirus transfer vector
- 2.6 *Mammalian cell expression systems-
Human Papova BK virus shuttle vector

Unit III: The human genome project

15

- 3.1 *The human genome, scope and goals of the project
- 3.2 Genetic linkage maps, chromosome walking, restriction mapping
- 3.3 Polymorphic DNA markers
- 3.4 Restriction fragment length polymorphism (RFLP) and its uses
- 3.5 Physical maps, Sequence tagged sites
- 3.6 Integrating genetic linkage and physical maps
- 3.7 *Mapping human diseases
- 3.8 Positional cloning: Getting closer to a disease causing gene
- 3.9 Testing for exons
- 3.10 Limitations of positional cloning

Unit IV: Regulations and patents in biotechnology

15

- 4.1 Regulating recombinant DNA technology
- 4.2 *Regulatory requirements – safety of genetically engineered foods
Chymosin, tryptophan, bovine somatotropin
- 4.3 Regulation environmental release of genetically engineered organism(GEO). Ice minus Pseudomonas syringae
- 4.4 Regulatory agencies and laws for product regulation
- 4.5 Risk assessment: How much risk?
- 4.6 *Open field tests of GEO
- 4.7 Development of policy for Human gene therapy
- 4.8 Patenting biotechnology inventions
 - a) What constitutes the patent?
 - b) The patent process
 - c) The conditions to be satisfied for an invention to be patentable
:Novelty, Inventiveness, Usefulness
 - d) Patenting in different countries, types of inventions that are not patentable in India
 - e) What is Paris convention? Principal features of Paris convention
 - f) Patenting multicellular organisms
 - g) Patenting and fundamental research

***marked topics are to be taken for seminar**

PSZOEND403: Vertebrate Endocrinology and Reproductive Biology

UNIT – I: General Endocrinology –II **15L**

1. General introduction to hormone

- Hormonal mechanism of intergration, Neurosecretion and neuroendocrine system.
- Neuroendocrine integration- Afferent pathways, Integration centers, Efferent pathways.
- First order neuroendocrine reflex
- Second order neuroendocrine reflexand .
- Third order neuroendocrine reflex

UNIT – II: Male Reproductive System **15L**

- Testis- Structure, spermatogenesis, spermiogenesis, steroidogenesis endocrine, paracrine and autocrine regulation.
- Epididymis- Structure, function and regulation.
- Accessory sex organs-Prostate, seminal vesicles, bulbo urethral gland- structure, function and regulation.

UNIT – III: Female reproductive tract -II **15L**

1. Study of Uterus :

- Uterus and fallopian tube- Structure, function and hormonal regulation, reproductive cycles in vertebrates.
- **Mammary gland**- Structure, function and regulation.

UNIT – IV: Contraception **15L**

- Sterility: Male and Female
- Regulation of male and female fertility.
- Surgical method.
- Hormonal and non-hormonal methods

COURSE CODE:- PSZOEND404

Comparative and Molecular Endocrinology

UNIT –I: Phylogeny and Ontogeny of endocrine glands **15L**

- Pituitary , Pancreas , Adrenal , Thyroid etc in the following classes Pisces, Amphibia, Reptiles and Mammals

UNIT –II: Biochemical Aspects **15L**

Mechanism of action of steroid hormones

- Steroid hormones receptors- expression, distribution, regulation Interaction with DNA-post transcription and post translational effects.
- Clinical uses of steroid receptors

UNIT – III: Mechanism of action of peptide hormones –II **15L**

- Nuclear binding and degradation.
- Regulation of gene expression by cell surface receptors.
- Defects in receptors-clinical uses.
- G-proteins

UNIT – IV: Applied Endocrinology –II **15L**

- Preparation of somatotrophin and its Application.
- Genetic analysis of hormonal disorders.

Semester IV

Practical

Course Code PSZOBT4P1 & PSZOBT4P2

Based on PSZOBT401 and PSZOBT402

- 1) Immobilize Yeast cells in calcium alginate & prepare a bioreactor column to demonstrate Invertase activity in the bioreactor column.
- 2) Restriction-digest the given DNA sample & demonstrate the separation of fragments by performing agarose gel electrophoresis. Interpret the results by comparing with the standard digests provided.
- 3) Demonstrate the western blotting technique for the given sample of protein.
- 4) To plot a growth curve for the microorganisms provided.
- 5) Demonstrate the effect of medium on growth curves of given microorganism, using two different media (minimal & enriched).

COURSE CODE: PSZOEND4P3

Based on PSZOEND403

1. Histological and cytological study of the following endocrine glands with the help of permanent slides

Pituitary, Pineal, Thyroid, Parathyroid, Islet of Langerhan's, Adrenal, Ultimobranchial glands, Corpuscles of Stannius

- 2 Dissection of male and female reproductive system of rat. (from preserved rat only)
3. Histological study of testes and ovaries from various vertebrates groups.
4. Study of vaginal histology during estrous cycle of rat.
5. Bilateral castration using a suitable animal (Rat/mice).
6. Ovariectomy in a suitable animal (Rat/mice).

COURSE CODE:- PSZOEND4P4

Based on PSZOEND404

1. Effect of epinephrine on blood sugar level and liver glycogen of a suitable animal
2. Effect of corticoids on the liver glycogen deposition in the rat/mouse.(Demonstration experiments)
- 3 Chromatographic separation of Gonadal hormone.
4. Rat Semen Analysis
5. Induction of Polycystic ovary and effect of drug.

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Endocrinology

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N.B :

I) It is pertinent to note that we have to adhere strictly to the directions as given in the UGC Circular F14-4/2006 (CPP-II).

II) Apart from the institutional Animal Ethics Committee (IAEC) and any other Committee appointed by a Competent Authority/Body from time to time, every college should constitute the following Committees :

- 1) A Committee for the Purpose of Care and Supervision of Experimental Animals (CPCSEA) and
- 2) A Dissection Monitoring Committee (DMC)

Composition of DMC shall be as follows :

- i) Head of the Concerned Department (Convener/Chairperson)
- ii) Two Senior Faculty Members of the concerned Department
- iii) One Faculty of related department from the same College
- iv) One or two members of related department from neighboring colleges.

Practical
Course Code PSZOBT 3P1

Q1) Determination of viable cell count in the given culture of bacteria by dilution & spreading technique. (DAY 1) (25) MARKS

OR

Q1) Using mini-prep method isolate plasmid DNA from the given strain of bacteria & show the purity of the isolate by performing agarose gel electrophoresis. (DAY 1) (25) MARKS

Q2) To estimate the Demonstration of aseptic technique: Work place for aseptic handling, packing glassware (flasks, test tubes, pipettes, petridish) for sterilization, aseptic transfer of liquids (pipetting from flask to test tube. (DAY 2) (15) MARKS

Q3) Viva (05) MARKS

Q4) Journal (05) MARKS

Practical
Course Code PSZOBT 3P2

Q1) Preparation of LB agar plate, slant, butt & demonstration of streaking technique using bacterial culture to obtain isolated colonies. (DAY 1) (25) MARKS

Q2) Estimate number of bacteria in given culture of nephelometry. (DAY 2) (15) MARKS

Q3) Viva (05) MARKS

Q4) Journal (05) MARKS

COURSE CODE PSZOEND3P3

Duration: 1 day

MARKS -50

Q1. Major question

(25 mks)

Surgical technique

a. Thyroidectomy in rat/mice

b. Adrenalectomy in rat/mice

Q2(A) Minor question (10 mks)

1. Dissection and localization of endocrine glands in rat
2. Hypophysectomy in fish (Tilapia, cat fish)

(B) Compulsory for all students (05 mks)

Permanent slide submission (one slide each to be submitted at the time of practical for Islets of Langerhans, CHP method and for pituitary, Mallory triple & AB-AS-OG methods to be used).

Q3. Viva-voce (05 mks)

Q4 . Journal (05 mks)

SEMESTER-III

COURSE CODE PSZOEND3P4

Duration: 1 day

MARKS -50

Q1. Major question (25 mks)

Estimation of Adrenal ascorbic acid and cholesterol in

- a. A normal animal (mice/rat).
- b. After the administration of ACTH, Epinephrine.

Q2. Minor question (15mks)

1. Effect of insulin administration on the blood sugar level in mice/rat
2. Paper chromatographic separation of corticoids

Q3. Viva-voce (05 mks)

Q4 . Journal (05 mks)

Practical
Course Code PSZOBT 4P1

Q1) Demonstrate the effect of medium on growth curves of given microorganism, using enriched media. (DAY 1) (25) MARKS

OR

Q1) Demonstrate the effect of medium on growth curves of given microorganism, using minimal media. (DAY 1) (25) MARKS

Q2) Immobilize Yeast cells in calcium alginate, prepare beads & keep them overnight in activation medium (DAY 1) (15) MARKS

Q3) Viva (05) MARKS

Q4) Journal (05) MARKS

Practical
Course Code PSZOBT 4P2

Q1) Prepare a bioreactor column to demonstrate Invertase activity in the bioreactor column. (DAY 2) (25) MARKS

Q2) Restriction-digest the given DNA sample & demonstrate the separation of fragments by performing agarose gel electrophoresis. Interpret the results by comparing with the standard digests provided. (DAY 2) (15) MARKS

OR

Q2) Demonstrate the western blotting technique for the given sample of protein.

(DAY 2) (15) MARKS

Q3) Viva (05) MARKS

Q4) Journal (05) MARKS

SEMESTER-IV

COURSE CODE: PSZOEND4P3

Duration: 1 day

MARKS -50

Q1. Major question

(25 mks)

Surgical technique

- a. Bilateral castration in rat/mice
- b. Unilateral Ovariectomy in rat/mice

Q2. . Minor question

(15 mks)

1. Dissection of male and female reproductive system of rat. (from preserved rat only)
2. Study of vaginal histology during estrous cycle of rat.

Q3. Viva-voce

(05 mks)

Q4 . Journal

(05 mks)

COURSE CODE:- PSZOEND4P4

Duration: 1 day

MARKS -50

Q1. Major question

(25 mks)

1. Effect of epinephrine on blood sugar level and liver glycogen of a suitable animal

Q2.(A) Minor question

(10mks)

1. Chromatographic separation of Gonadal hormone.
2. Rat Semen Analysis

(B) Compulsory for all students

(05 mks)

Induction of Polycystic ovary and effect of drug (Two slide of ovary to be submitted one of control and one of Polycystic ovary)

Q3. Viva-voce

(05 mks)

Q4 . Journal

(05 mks)

